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| ART UNIT | PAPER NUMBER |
|---|---|
| 1638 | |

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Please find below and/or attached an Office communication concerning this application or proceeding.

| Office Action Summary | Application No. | Applicant(s) | |
|---|---|---|---|
| | 09/828,447 | E SILVA ET AL. | |
| | Examiner | Art Unit | |
| | Cynthia Collins | 1638 | |

*-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --*

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

1)☒ Responsive to communication(s) filed on *08 July 2002* .

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

4)☒ Claim(s) *1-35* is/are pending in the application.

4a) Of the above claim(s) *12-14 and 24-35* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☐ Claim(s) *1-11 and 15-23* is/are rejected.

7)☐ Claim(s) *2-5,10,11,15-17 and 20-23* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

**Application Papers**

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11)☐ The proposed drawing correction filed on _____ is: a)☐ approved b)☐ disapproved by the Examiner.

If approved, corrected drawings are required in reply to this Office action.

12)☐ The oath or declaration is objected to by the Examiner.

**Priority under 35 U.S.C. §§ 119 and 120**

13)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____ .

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

14)☒ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).

a)☐ The translation of the foreign language provisional application has been received.

15)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

**Attachment(s)**

1)☒ Notice of References Cited (PTO-892)
2)☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3)☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) *3, 11* .
4)☐ Interview Summary (PTO-413) Paper No(s). _____ .
5)☐ Notice of Informal Patent Application (PTO-152)
6)☐ Other: .

## DETAILED ACTION

### *Election/Restrictions*

Applicant's election with traverse of Group I, claims 1-11 and 15-23, and Invention B, SEQ ID NOS: 12 and 7 (PLC-2), in Paper No. 10 is acknowledged. The traversal is on the ground(s) that examination of the five groups of sequences (A-E) would not be an undue burden because of their close technological relationship, on the ground(s) that the Examiner has not provided evidence that a search of all the STSRP proteins and nucleic acids would be seriously burdensome, on the ground(s) that according to The Official Gazette Notice of November 19, 1996, a reasonable number of sequences may be claimed in a single application and according to MPEP 803.04 ten sequences are considered a reasonable number, and on the ground(s) that examination of claims relating to PLC-1 and PLC-2 (SEQ ID NOS 11 and 6, 12 and 7) would not be an undue burden because of their close technological relationship.

This is not found persuasive because although all five groups of sequences may be related, and although the two groups of sequences of PLC-1 and PLC-2 may be even more closely related, each distinct sequence requires a separate search. Additionally, The Official Gazette Notice of November 19, 1996 is one that permits the Examiner to waive restriction to no more than one invention. Since 1996, databases and resource allocations at the PTO have changed and the examination of more than one distinct sequence on the merits in the instant application would present a burden on PTO resources. Accordingly, claims 12-14 and 24-35, and SEQ ID NOS: 11, 6, 13, 8, 14, 9, 15 and 10 are withdrawn from consideration as being drawn to nonelected inventions.

The requirement is still deemed proper and is therefore made FINAL.

### *Information Disclosure Statement*

Initialed and dated copies of Applicant's IDS forms 1449, filed July 9, 2001 and October 7, 2002, Paper Nos. 3 and 11, are attached to the instant Office action.

### *Claim Objections*

Claims 2-5, 15-17 and 20-23 are objected to because they recite the sequences of nonelected inventions. Appropriate correction is required.

Claims 10 and 11 are objected to under 37 CFR 1.75(c) as being in improper form because a multiple dependent claim should refer to other claims in the alternative only, and/or cannot depend from any other multiple dependent claim. See MPEP § 608.01(n).

### *Claim Rejections - 35 USC § 112*

The following is a quotation of the first paragraph of 35 U.S.C. 112:

> The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

Claims 1-2, 6-11, 15 and 18-20 are rejected under 35 U.S.C. 112, first paragraph, as containing subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention. This is a written description rejection.

The claims are drawn to transgenic plant cells transformed with a Signal Transduction Stress-Related Protein (STSRP) coding nucleic acid, including a Phospholipase C-2 (PLC-2)

protein coding nucleic acid and orthologs thereof. The claims are also drawn to a transgenic plant and seed, an isolated nucleic acid encoding a Signal Transduction Stress-Related Protein, and a method of producing a transgenic plant using an isolated nucleic acid encoding a Signal Transduction Stress-Related Protein.

The specification describes five DNA molecules isolated from *Physcomitrella patens* that encode different types of proteins homologous to various structurally and functionally distinct proteins that have been associated with signal transduction (page 46 Table 1). Two of these isolated DNA molecules, including the elected nucleic acid of SEQ ID NO:7 encoding a protein of SEQ ID NO: 12 (PLC-2), have homology to phosphoinositide-specific phospholipase C, as well as homology to phosphatidylinositol-specific phospholipase C and 1-phoisphatidylinositol-4,5-biphosphate phosphodiesterase (pages 46-48 Tables 1-3). All five of these isolated DNA molecules improve drought stress tolerance when expressed in transgenic *Arabidopsis* plants, including the elected nucleic acid of SEQ ID NO:7 (page 58 Table 9). Three of these isolated DNA molecules improve freezing stress tolerance when expressed in transgenic *Arabidopsis* plants, including the elected nucleic acid of SEQ ID NO:7 (page 59 Table 10). This does not constitute a substantial portion of the genera that comprise Signal Transduction Stress-Related Protein coding nucleic acids or Phospholipase C-2 protein coding nucleic acids and orthologs thereof, each of which increase tolerance to an environmental stress when expressed in a transgenic plant cell. Each of the claimed genera encompasses a multitude of different nucleotide sequences and proteins, including those yet to be discovered. Furthermore, the recitation of "orthologs thereof" in the claims imply that orthologs of STSRPs exist, yet the specification does not describe, and the prior art does not teach, the structure of any STSRP ortholog. The

disclosure of only five isolated DNA molecules that encode different proteins homologous to proteins that have been associated with signal transduction, all five of which improve drought stress tolerance and three of which improve freezing stress tolerance when expressed in transgenic *Arabidopsis* plants does not provide an adequate description of the claimed genera, and in view of the level of knowledge and skill in the art, one skilled in the art would not recognize from the disclosure that the applicant was in possession of the claimed genera (see Written Description Guidelines, Federal Register, Vol. 66, No. 4, January 5, 2001, pages 1099-1111).

Claims 1-11 and 15-23 are rejected under 35 U.S.C. 112, first paragraph, because the specification, while being enabling for a transgenic plant transformed with a nucleic acid of SEQ ID NO:7 encoding a PLC-2 polypeptide of SEQ ID NO:12, said plant exhibiting increased tolerance to drought and freezing stress, does not reasonably provide enablement for transgenic plants transformed with other Signal Transduction Stress-Related Protein coding nucleic acids, said plants exhibiting tolerance to all environmental stresses. The specification does not enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention commensurate in scope with these claims.

The claims are drawn to transgenic plant cells transformed with a Signal Transduction Stress-Related Protein (STSRP) coding nucleic acid, including a Phospholipase C-2 (PLC-2) coding nucleic acid and orthologs thereof, a PLC-2 nucleic acid encoding SEQ ID NO:12, a PLC-2 coding nucleic acid of SEQ ID NO:7, and a STSRP coding nucleic acid that hybridizes under stringent conditions to SEQ ID NO:7. The claims are also drawn to a transgenic plant and

seed, an isolated nucleic acid encoding a Signal Transduction Stress-Related Protein, and a method of producing a transgenic plant.

The specification discloses the elected nucleic acid of SEQ ID NO:7 isolated from *Physcomitrella patens* that encodes a protein (PLC-2) of SEQ ID NO:12 having amino acid sequence homology to a phosphoinositide-specific phospholipase C (page 46 Table 1). The specification also discloses that expression of a nucleic acid of SEQ ID NO:7 in transgenic *Arabidopsis* increases the plant's tolerance to drought stress and freezing stress as compared to nontransformed control plants (pages 58-59 Tables 9 and 10).

The specification discloses the elected nucleic acid of SEQ ID NO:9 isolated from *Physcomitrella patens* that encodes a protein (GBP-4) of SEQ ID NO:14 having amino acid sequence homology to phragmoplastin 5 (page 47 Table 1), as well as to dynamin-like proteins (page 51 Table 5). The specification also discloses that expression of a nucleic acid of SEQ ID NO:9 in transgenic *Arabidopsis* increases the plant's tolerance to drought stress and freezing stress as compared to nontransformed control plants (pages 60-61, Tables 9 and 10).

While one of skill in the art could readily make transgenic plants expressing any polynucleotide encoding a polypeptide having homology to a known phosphoinositide-specific phospholipase C, it would require undue experimentation for one skilled in the art to determine which polynucleotide to express and at what level, because the ability of such a polynucleotide to confer stress tolerance in a transgenic plant is unpredictable. The specification does not provide sufficient guidance for one skilled in the art to determine which polynucleotide to express and at what level, because the specification teaches only four other polynucleotides encoding different proteins having homology to proteins that have been associated with signal transduction that can

increase drought stress tolerance when expressed in a transgenic plant. Also, while one of skill in the art could readily make transgenic plants comprising any polynucleotide encoding a polypeptide having homology to proteins that have been associated with signal transduction, it would require undue experimentation for one skilled in the art to determine how to express such a polynucleotide in a manner that would increase tolerance to stresses other than drought or freezing, because the specification does not teach how to express a polynucleotide encoding a protein that has been associated with signal transduction such that tolerance to stresses other than drought or freezing is increased, such as salinity, water-logged or poorly aerated soils. Furthermore, the specification does not disclose the structure and function of any Signal Transduction Stress Related Protein ortholog or PLC-2 ortholog, and such orthologs cannot be predicted from Applicant's disclosure, as orthologs by definition have evolved to become "different" from each other. The specification does not provide sufficient guidance for one skilled in the art to identify, without undue experimentation, Signal Transduction Stress Related Protein orthologs or PLC-2 orthologs that could be used to practice the claimed invention. Additionally, the specification does not disclose the effect of expressing a polynucleotide encoding a polypeptide having homology to proteins that have been associated with signal transduction on environmental stress tolerance in any host cell type other than a plant cell. While one of skill in the art could readily transform other types of host cells, such as bacteria, yeast, mammalian, etc., and express any polynucleotide encoding a polypeptide having homology to proteins that have been associated with signal transduction, it would require undue experimentation for one skilled in the art to identify which type of host cell to transform, and how to express the polynucleotide in that cell such that environmental stress tolerance of the host

cell is increased, because the ability of such a polynucleotide to confer stress tolerance in host cells other than plant cells is unpredictable.

The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claims 1-11 and 15-23 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claims 1-5, 15-17 and 19-23 are indefinite in the recitation of "Stress-Related Protein" or "STSRP", because the relationship between stress and the protein is unclear. Does the protein alleviate stress, or is the protein expressed in response to stress?

Claims 1 11, 18 and 19 are indefinite in the recitation of "environmental stress". It is unclear what type of environmental stress the cell would have increased tolerance to, as a change in any environmental parameter may be a source of stress to a cell.

Claims 2, 15 and 20 are indefinite in the recitation of "orthologs thereof". It is unclear what orthologs are intended, orthologs of CBP-1, or orthologs of all five proteins?

Claims 5, 17 and 23 are indefinite in the recitation of "hybridizes under stringent conditions". It is unclear what conditions would yield the claimed nucleic acid molecules, as those skilled in the art define stringency differently. It is suggested that the claims be amended to recite specific hybridization conditions.

Claim 9 is indefinite in the recitation of "forage crop", as a forage crop is not a plant.

Claims 10 and 11 are indefinite in the recitation of the indefinite article "a" before "plant cell". It is suggested that the claims be amended to recite "the plant cell".

Claim 11 is indefinite in the recitation of "true breeding", as it is unclear how a seed would be "true breeding". Does the seed contain the nucleic acid of interest? Is the seed homozygous?

Claim 19 is rejected under 35 U.S.C. 112, second paragraph, as being incomplete for omitting essential steps, such omission amounting to a gap between the steps. See MPEP § 2172.01. Claim 19 is missing the essential step of expressing a Signal Transduction Stress-Related Protein. In the absence of expression of a Signal Transduction Stress-Related Protein, the method of claim 19 will not result in the production of a transgenic plant with an increased tolerance to environmental stress.

***Claim Rejections - 35 USC § 101***

35 U.S.C. 101 reads as follows:

> Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefore, subject to the conditions and requirements of this title.

Claim 11 is rejected under 35 U.S.C. 101 because the claimed invention is directed to non-statutory subject matter.

Claim 11 is drawn to seed, but is not limited to seed that comprise the construct that was introduced into the parent plant. Due to Mendelian inheritance of genes, a single gene introduced into the parent plant would only be transferred to half of the seeds of that plant. In addition, even though the claim recites that the seed is true breeding for an increased tolerance to an environmental stress, a native gene independent of the transgene introduced into the parent

could confer such a trait, given that there is no indication that there would be any other distinguishable characteristics of the claimed seed, it is unclear whether the claimed seeds would be distinguishable from seeds that would occur in nature. See *Diamond v. Chakrabarty,* 447 U.S. 303 (1980), *Funk Bros. Seed Co. V. Kalo Inoculant Co.*, 233 U.S. 127 (1948), and *In re Bergey*, 195 USPQ 344, (CCPA). The amendment of the claims to recite that the seed comprises the construct that was introduced into the parent plant would overcome the rejection.

***Claim Rejections - 35 USC § 102***

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 1, 5, 8, 10, 17-19 and 23 are rejected under 35 U.S.C. 102(b) as being anticipated by Fan et al. (The Plant Cell, Vol. 9, 2183-2196, December 1997).

The claims are drawn to transgenic dicotyledonous plants and plant cells transformed with a Signal Transduction Stress-Related Protein (STSRP) coding nucleic acid, including a STSRP coding nucleic acid that hybridizes under stringent conditions to SEQ ID NO:7, the expression of said nucleic acids resulting in increased tolerance to an environmental stress. The claims are also drawn to an isolated STSRP coding nucleic acid that that hybridizes under stringent conditions to SEQ ID NO:7, an isolated recombinant expression vector, and a method of producing a transgenic plant using a Signal Transduction Stress-Related Protein (STSRP) coding nucleic acid, including an isolated STSRP coding nucleic acid that that hybridizes under

stringent conditions to SEQ ID NO:7, wherein expression of the nucleic acid results in increased tolerance to an environmental stress.

Fan et al. teach transgenic dicotyledonous *Arabidopsis* plants and plant cells transformed with a recombinant expression vector comprising a Phospholipase Dα coding nucleic acid (page 2193 column 1 first and second full paragraph). The Phospholipase Dα coding nucleic acid would hybridize under "stringent conditions" to SEQ ID NO:7 because the claims do not limit the stringency conditions, or the length of the nucleic acid that would hybridize to SEQ ID NO:7 under unspecified stringency conditions. Expression of the Phospholipase Dα nucleic acid in the plant cells results in increased tolerance to an environmental stress because expression of the Phospholipase Dα nucleic acid results in increased resistance of transgenic plants to abscisic acid and ethylene induced senescence (page 2187 Figure 4 and 2189 Figure 8).

Claims 1-2, 5, 6, 8-10, 15, 17-20 and 23 are rejected under 35 U.S.C. 102(b) as being anticipated by Shi et al. (The Plant Journal, 1995, Vol. 8, No. 3, 381-390).

The claims are drawn to transgenic dicotyledonous tobacco plants and plant cells transformed with a Phospholipase C-2 Signal Transduction Stress-Related Protein (STSRP) coding nucleic acid and orthologs thereof, including a STSRP coding nucleic acid that hybridizes under stringent conditions to SEQ ID NO:7, the expression of said nucleic acids resulting in increased tolerance to an environmental stress. The claims are also drawn to an isolated Phospholipase C-2 Signal Transduction Stress-Related Protein (STSRP) coding nucleic acid and orthologs thereof, including a STSRP coding nucleic acid that hybridizes under stringent conditions to SEQ ID NO:7, an isolated recombinant expression vector, and a method of

producing a transgenic plant using an isolated Phospholipase C-2 Signal Transduction Stress-Related Protein (STSRP) coding nucleic acid, including an isolated STSRP coding nucleic acid that that hybridizes under stringent conditions to SEQ ID NO:7, wherein expression of the nucleic acid results in increased tolerance to an environmental stress.

Shi et al. teach transgenic dicotyledonous tobacco plants and plant cells transformed with a recombinant expression vector comprising a phosphoinositide-specific phospholipase C coding nucleic acid isolated from soybean (page 385 Figure 3, page 388 column 2 third full paragraph). Because the soybean phosphoinositide-specific phospholipase C is a phospholipase C protein, the soybean phosphoinositide-specific phospholipase C is a PLC-2 ortholog. Because the soybean phosphoinositide-specific phospholipase C is a phospholipase C protein, a soybean phosphoinositide-specific phospholipase C coding nucleic acid would hybridize under "stringent conditions" to SEQ ID NO:7. Although Shi et al. do not explicitly teach that expression of the soybean phosphoinositide-specific phospholipase C nucleic acid in the plant cells results in increased tolerance to an environmental stress, such a phenotype would be inherent in the transgenic plants and cells taught by Shi et al., as the method taught by Shi et al. is indistinguishable from the claimed method.

***Remarks***

No claim is allowed.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Cynthia Collins whose telephone number is (703) 605-1210. The examiner can normally be reached on Monday-Friday 8:45 AM -5:15 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Amy Nelson can be reached on (703) 306-3218. The fax phone numbers for the organization where this application or proceeding is assigned are (703) 308-4242 for regular communications and (703) 308-4242 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0196.

CC
October 17, 2002

Phuong Bui

PHUONG T. BUI
PRIMARY EXAMINER 10/18/02